INFRANOR

XtrapulsCD1-pm
Installation manual

PROFIBUS POSITIONER

WARNING

This is a general manual describing a series of servo drives having output capability suitable for driving AC brushless sinusoidal servo motors.

Instructions for storage, use after storage, commissioning as well as all technical details require the MANDATORY reading of the manual before getting the drives operational.

Please see Xtrapuls CD1-pm User Guide for the operation of the drive (commissioning, configuration…).

For the PROFIBUS communication, see manual Xtrapuls CD1-pm – PROFIBUS Communication Profile.

Maintenance procedures should be attempted only by highly skilled technicians having good knowledge of electronics and servo systems with variable speed (EN 60204-1 standard) and using proper test equipment.

The conformity with the standards and the "CE" approval is only valid if the items are installed according to the recommendations of the drive manuals. Connections are the user's responsibility if recommendations and drawings requirements are not met.

Any contact with electrical parts, even after power down, may involve physical damage.
Wait for at least 5 minutes after power down before handling the drives (a residual voltage of several hundreds of volts may remain during a few minutes).

ESD INFORMATION (ElectroStatic Discharge)
INFRANOR drives are conceived to be best protected against electrostatic discharges. However, some components are particularly sensitive and may be damaged if the drives are not properly stored and handled.

STORAGE

- The drives must be stored in their original package.
- When taken out of their package, they must be stored positioned on one of their flat metal surfaces and on a dissipating or electrostatically neutral support.
- Avoid any contact between the drive connectors and material with electrostatic potential (plastic film, polyester, carpet…).

HANDLING

- If no protection equipment is available (dissipating shoes or bracelets), the drives must be handled via their metal housing.
- Never get in contact with the connectors

ELIMINATION
In order to comply with the 2002/96/EC directive of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE), all INFRANOR devices have got a sticker symbolizing a crossed-out wheel dustbin as shown in Appendix IV of the 2002/96/EC Directive.
This symbol indicates that INFRANOR devices must be eliminated by selective disposal and not with standard waste.

INFRANOR does not assume any responsibility for any physical or material damage due to improper handling or wrong descriptions of the ordered items.
Any intervention on the items, which is not specified in the manual, will immediately cancel the warranty.

Infranor reserves the right to change any information contained in this manual without notice.

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Chapter 1 – General description

1- INTRODUCTION

Series Xtrapuls CD1-pm Profibus positioners are PWM servo drives for the control of AC sinusoidal motors (brushless) equipped with a position sensor.

The Xtrapuls CD1-pm servo drive is available as a stand-alone single-axis block that includes all supplies and mains filter. It is available in both mains operated versions 230 VAC and 400/480 VAC.

The Xtrapuls CD1-pm positioner operates with a PROFIBUS DP interface or in stand-alone by using only digital I/Os. It generates itself the positioning trajectory that allows the programming of 128 positioning sequences.

2 – DESCRIPTION / COMPLIANCE WITH THE STANDARDS

2.1 - GENERAL DESCRIPTION

The Xtrapuls CD1-pm drive directly controls the motor torque and speed by means of the information provided by a high resolution position sensor (resolver or encoder). The sinusoidal current commutation based on this high resolution position sensor provides very smooth motor torque/force control.

The Xtrapuls CD1-pm drive can be configured for the feedback of various position sensor types. The appropriate position sensor configuration is selectable by software and saved in the drive.

- With a resolver sensor feedback, the motor absolute position value over one revolution is available and the servo motor can immediately be enabled after the drive power up.

- With a "SinCos tracks" sensor which provides two analog Sin and Cos signals electrically compliant with the SinCos encoder signals and which period is equal to the motor pole pitch, the servo-motor can be immediately enabled after the powering of the drive.

- With an absolute single-turn SinCos encoder feedback (Heidenhain ERN 1085 or compliant), the servo motor can also immediately be enabled after the drive power up.

- With an incremental encoder only, a motor phasing procedure (Phasing) must be executed at each drive power up before the motor enabling.

- With an incremental encoder + Hall Effect Sensors (HES) feedback, the motor phasing procedure is no more necessary and the servo motor can immediately be enabled after the drive power up.

- With an absolute single-turn, multi-turn or linear encoder using the ENDAT or HIPERFACE communication protocols and fitted with incremental SinCos outputs, the servo-motor can also be immediately enabled after the powering of the drive.

Series Xtrapuls CD1-pm positioners have their own DC/DC converter to provide appropriate logic voltage to the modules. An auxiliary 24VDC +/- 15 % supply is generally available on all machines and supplies a DC/DC converter with all logic supplies required by the positioner. The auxiliary supply allows to keep the logic board on, after the power supply has been switched off, in order to keep all parameters in the memory and to avoid initializing the machine all over again. A 24 VDC battery supply with specific wiring allows to keep the position even after switching off the auxiliary 24 VDC supply. This wiring can be used for "absolute" operation with the Xtrapuls CD1-pm positioner (see chapter 4: Connections).

The power supply is depending on the positioner type:

- Xtrapuls CD1-pm-230/l: 230 VAC single-phase mains operation power supply with limitation of the operation power (see chapter 2, section 1.1) or three-phase via a transformer or an autotransformer (or direct three-phase mains operation if there are three-phase mains available in 200 to 230 VAC).

- Xtrapuls CD1-pm-400/l: 400 to 480 VAC three-phase mains operated power supply.

A soft start system of the power supply allows to limit the inrush current at power on.

The very small dimensions of the Xtrapuls CD1-pm positioner allow an optimum integration in 300 mm deep cabinets (connectors included). The Xtrapuls CD1-pm positioner operates with a PROFIBUS DP interface or in stand-alone by using only digital I/Os. The selection of the various operation modes (PROFIBUS or stand-alone) is made by means of micro-switches accessible by the operator.

2.2 - REFERENCE TO THE STANDARDS: "CE" CERTIFICATION

Series Xtrapuls CD1-pm positioners have been approved with regard to their conformity with the Electromagnetic Compatibility standards concerning the power servos referenced in the EN 61800-3:2004 standard "Electrical variable speed power servo systems":

- EN 55011, group 1, C3 category, regarding radiated radioelectric disturbances,
- EN 61000.4-2-3-4-5 regarding immunity.

Standard to be applied to the electrical equipment of industrial machines: EN 60204-1.

These items have been "CE" marked since year 2000.

2.3 - REFERENCE TO THE STANDARDS: "UL" LISTING

Xtrapuls CD1-pm series have been "$_{C}UL_{US}$" listed according to UL508C, and UL840 regarding the insulator.

This product was evaluated to:

- the Third Edition of UL508C, the UL Standard for Power Conversion Equipment, dated May 2002 for the UL Listing (USL),

- the CSA Standard for Industrial Control Equipment, C22.2 N° 14-95, dated August 1995 for the Canadian UL Listing (CNL).

Providing that the manual is specifying that the end user has to provide an isolated power supply, for 24 VDC auxiliary input protected by a 4 A UL Listed fuse, the power board is considered within a limited voltage/current circuit per section 31.4 of UL508C. Therefore, spacings on the power board are not required to be evaluated per section 31.2 of UL508C and were evaluated according to UL 840.

Per UL 840 (Second Edition, dated May 20, 1993) requirements, spacings are limited to 2.5 mm assuming pollution degree 2 environment.

Ground connection is fixed in the frame of the device by a rivet, Avibulb masse, BN10-5168. The connector complies with standard dimensions given in table 6.2 of UL 310, the standard for Electrical Quick connect terminals.

3 - OTHER DOCUMENTS REQUIRED FOR THE COMMISSIONING

- " Xtrapuls CD1-pm Profibus positioner User Manual".

- " Xtrapuls CD1-pm Profibus Communication Profile".

- "CD1-pm SinCos track feedback" application note regarding the use of motors equipped with "SinCos tracks" position sensors.

- "CD1-pm absolute encoders feedback" application note regarding the use of absolute single-turn, multi-turn or linear encoders using the ENDAT or HIPERFACE Communication protocols.

Chapter 2 – Specifications

1 - MAIN TECHNICAL DATA

1.1 – XTRAPULS CD1-pm-230-/I POSITIONER

Mains operated power supply voltage	230 VAC + 10 %/- 15 % 1~ or 3~, 50 - 60 Hz
Isolated auxiliary galvanic and motor brake supply voltage	24 VDC +/- 15 % - 320 mA without brake
Motor phase-phase output voltage	200 V_{rms}
Integrated braking system	External 100 Ohm/100 W braking resistor (dp 100/100) Min. resistance: 50 Ohm (dp 50/200)
Minimum inductance between phases	1 mH

OUTPUT CURRENT RATINGS (at a maximum room temperature of 40°C)

Drive type	Max. output current (Arms) for 1 sec. +/- 5 % (230 VAC)	Rated output current (Arms) (230 VAC)	Power losses (W)	Rated input current (Arms) (230 VAC, 60 Hz)	Max. protection fuses for line circuit RK5 listed (Bussman / Littelfuse)	Short-circuit power of the mains	UL listed
CD1-pm-230/2.25	2.25	1.1	25	1.1	6 A	5 kA	yes
CD1-pm-230/4.5	4.5	2.25	30	2.25	6 A	5 kA	yes
CD1-pm-230/7.5	7.5	3.75	44	3.75	6 A	5 kA	yes
CD1-pm-230/10.5	10.5	5.25	55	5.25	6 A	5 kA	yes
CD1-pm-230/16.5	16.5	8.25	66	8.25	9 A	5 kA	yes

OPERATION POWER RESTRICTION IN SINGLE-PHASE

Continuous RMS power ensuring a capacitor lifetime of 20 000 hours:
650 W for Xtrapuls CD1-pm-230/2.25 to 10.5
1000 W for Xtrapuls CD1-pm-230/16.5

1.2 – XTRAPULS CD1-pm-400/I POSITIONER

Mains operating power supply voltage	400 to 480 VAC + 10 %/- 15 % 3~, TN or TT system with grounded neutral point 50 to 60 Hz (phase-ground voltage must be balanced)
Isolated auxiliary and motor brake supply voltage	24 VDC +/- 15 % - 320 mA without brake
Motor phase-phase output voltage	380 to 460 Vrms depending on the mains
Integrated braking system	Xtrapuls CD1-pm-400/1.8 to 7.2 A: External 200 Ohms/100 W resistor (dp 200/100) Minimum resistor value: 150 Ohms/100 W Xtrapuls CD1-pm-400/14: External 50 Ohms/200 W resistor (dp 50/200) Xtrapuls CD1-pm-400/30/45: External resistor 33Ω/280 W (dp 33/280) Xtrapls CD1-pm-400/70/90: External resistor 16.5Ω/560 W (dp 16.5/560)
Minimum inductance between phases	2 mH

OUTPUT CURRENT RATINGS (at a maximum room temperature of 40°C)
Output voltage range for 400-480 VAC (rms) three-phase mains
Output current range: 1.8 A, 2.7 A, 5.1 A, 7.2 A, 14 A, 30 A, 45 A, 70 A, 90 A (rms)

Drive type	Max. output current (Arms) for 1 sec. +/- 5 % (480 VAC)	Rated output current (Arms) (480 VAC)	Power losses (W)	Rated input current (Arms) (480 VAC, 60 Hz)	Max. protection fuses for line circuit RK5 listed or A60Q40 for 400/70 and 400/90 listed	Short-circuit power of the mains	UL listed
CD1-pm-400/1.8	1.8	0.9	35	0.9	2 A	5 kA	yes
CD1-pm-400/2.7	2.7	1.35	43	1.35	2 A	5 kA	yes
CD1-pm-400/5.1	5.1	2.55	71	2.55	4 A	5 kA	yes
CD1-pm-400/7.2	7.2	3.6	93	3.6	4 A	5 kA	yes
CD1-pm-400/14	14	7	200	7	8 A	5 kA	yes
CD1-pm-400/30	30	15	400	15	20 A	5 kA	yes
CD1-pm-400/45	45	20	560	20	20 A	5 kA	yes
CD1-pm-400/70	70	35	650	35	40 A	5 kA	yes
CD1-pm-400/90	90	35	650	35	40 A	5 KA	yes

1.3 - COMMON SPECIFICATIONS TO BOTH POSITIONER VERSIONS XTRAPULS CD1-pm-230/I AND XTRAPULS CD1-pm-400/I

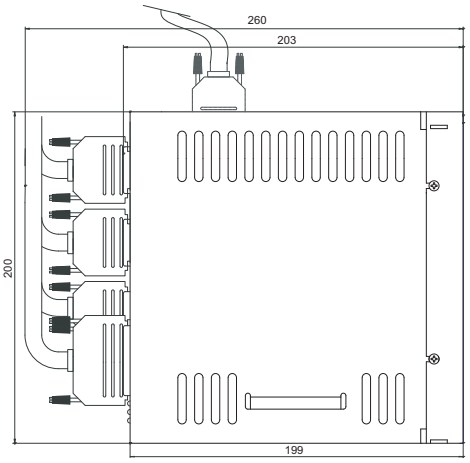
Regulation loops: current, speed and position	Digital
Mains filter on power supply	Integrated in the positioner CD1-400/90 exception: - EMC capacitors integrated - Common mode choke not integrated - Recommended filter: F-400-70-90
Common mode filter on auxiliary supply	Integrated in the positioner
Common mode filter on motor brake supply	Integrated in the positioner
Power stage protections	- power supply overvoltage - internal switch protection - short-circuit between motor phases or between motor phase and ground - drive overtemperature (on Xtrapuls CD1-pm-400/I only) - fan system error - PWM control error - power stage supply error - braking system error
Motor brake control	Max. 1.5 A with 24 VDC
PWM switching frequency	8 kHz
Minimum inductance between phases	1 mH for 230 V / 2 mH for 400 V
Digital current regulator (PI)	Adjusted to the motor
Current loop bandwidth	Cut-off frequency for 45° phase shift : 1000 Hz
Internal current limitation	Imax: 20 % to 100 % and Irated: 20 % to 50 % Imax duration = 1 second
Digital speed and position regulators	Sampling period = 0,5 ms Anti-wind-up system of the integrator Adjustable digital gains
Speed loop bandwidth	Selectable cut-off frequency for 45° phase shift: 50 Hz, 75 Hz or 100 Hz

Max. motor speed	Adjustable from 100 rpm to 25 000 rpm
Resolver input	Position conversion: 65536 ppr (16 bit) Excitation frequency: 8 kHz Transformation ratio: 0.3 to 0.5 (other available values are factory set)
Encoder input	Selectable by software: Quadrature signals A & B with Z marker pulse RS 422 line receiver Maximum pulse frequency: 1 MHz Resolution: 500 to 10^6 ppr Incremental Sin/Cos encoder Heidenhain 1Vcc Sin/Cos type or compliant Maximum signal frequency: 200 kHz Resolution: 500 to 10^6 ppr Interpolation factor: 1024 Absolute single-turn Sin/Cos encoder Heidenhain ERN 1085 or compliant Maximum signal frequency: 200 kHz Resolution: 2048 or 512 ppr Interpolation factor: 1024
Hall sensors input	Selectable by software: 120° or 60° HES type 5 V or 12 V supply voltage HES sequence error detection
Encoder position output	A and B channels in quadrature Z marker pulse: 1 per motor revolution RS-422 line driver Programmable resolution from 64 ppr to 16384 ppr Arc minute accuracy = (8 + 5400/Resolution)
Logic inputs	- Enable / Disable: ENABLE - Limit switch +: FC+ - Limit switch -: FC- - Homing input: INDEX - Reset of a stored fault: RESET - Sequence start: START - Sequence stop: STOP - Programmable inputs : IN1 to IN6
Logic outputs	- Sequence in progress: SEQ - Position reached: POS - Speed reached :SPEED - Programmable outputs : OUT1 to OUT4
Analog input	+/-10 V resolution 14 bit (1 reconfigurable logic output) On-the-fly speed limitation Polarity selectable by software: -no limitation for 0 Volt -no limitation for 10 Volt
Analog output	+/-10 V resolution 8 bit (1 reconfigurable logic output) Load: 10 mA, linearity: 2%, low pass filter: 170 Hz Programmable output signal: Channel 1 of the digital oscilloscope (current, speed or position) or Phasing OK output (from 0 V to 10 V when the motor phasing is OK for an incremental encoder without HES)
Relay outputs	Relay contact: Umax = 50 V Imax = 100 mA, Pmax = 10 W "Amp ready": Closed if drive OK, open if fault

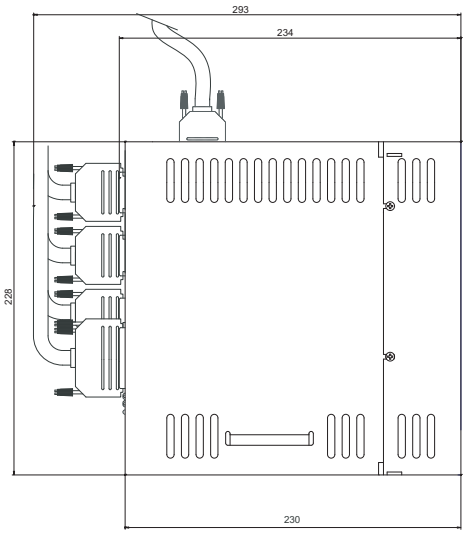
Open collector output protected against load short-circuit	Motor brake coil with 24 VDC/1.5 A
PROFIBUS link	PPO-1 or PPO-2 or PPO-3 or PPO-4.
Fault display	LEDs on front panel and diagnostic by serial link RS232 + diagnostic by PROFIBUS.
Motor and application parameter setting	Serial link RS232 or Profibus DP link
Automatic functions	Drive adjustment to the motor (AUTO-PHASING) Automatic regulator tuning (AUTO-TUNING)
Compliance with the standards: **CE** certification. 360° shield connection, equipotentiality according to the wiring rules. Xtrapuls CD1-pm-400/70 and 90 A with mains filter F-400-70/90	EMC standards: - immunity: EN 61000.4-2-3-4-5 - conducted and radiated disturbances: EN 55011, Group 1, C3 category Electrical standards for industrial machines: - EN 60204-1 : insulator 1500 Vac / 1 mn leakage current > 30 mA (EMI filters).
Compliance with the standards: **UL** listing "360°" shield; equipotentiality according to the wiring rules.	Xtrapuls CD1-pm series have been "$_{C}UL_{US}$" listed according to UL508C, and UL840 regarding the insulator. This product was evaluated to: - the Third Edition of UL508C, the UL Standard for Power Conversion Equipment, dated May 2002 for the UL Listing (USL), - the CSA Standard for Industrial Control Equipment, C22.2 N° 14-95, dated August 1995 for the Canadian UL Listing (CNL).
Temperature - storage -20° C à +70° C - operation +5° C à +40° C	From 40° C, the rated currents must be reduced of 3 % per additional Celsius degree Max. temperature: 50° C
Altitude	1000 m
Moisture	< 50% at 40° C and < 90% at 20° C: EN 60204-1 standard **Condensation prohibited** (storage and operation)
Cooling	Forced air (fan integrated in the Xtrapuls CD1-pm positioner) Check for free ventilation and no upper or lower obstruction of the air admissions
Mounting position	Vertical
Environment	Open chassis to be mounted in a housing protecting the drive from conducting dust and condensation (pollution degree 2 environment)
Mounting location	Closed cabinet without any conducting and/or corroding agents and according to the environment conditions requirements. Condensation prohibited
Weight	Xtrapuls CD1-pm-230/I: approx. 1 kg Xtrapuls CD1-pm-400/1.8 to 7.2: approx. 1.5 kg Xtrapuls CD1-pm-400/14: approx. 3 kg Xtrapuls CD1-pm-400/30 and 45: about 4.8 kg Xtrapuls CD1-pm-400/70 and 90: about 5.3 kg

2 - DIMENSIONS

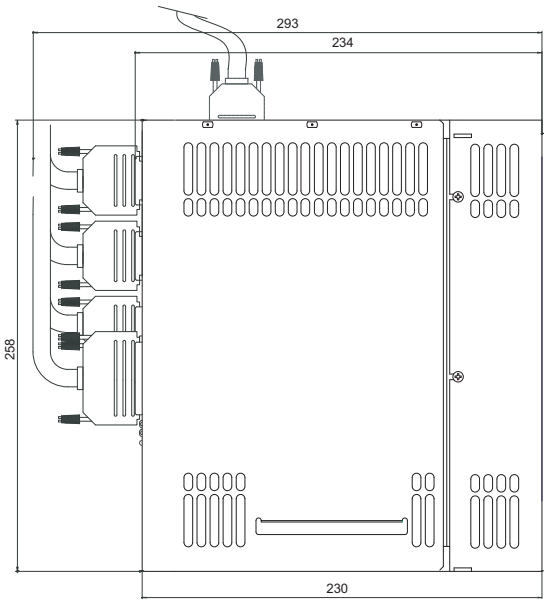
2.1 - XTRAPULS CD1-pm-230/I POSITIONER



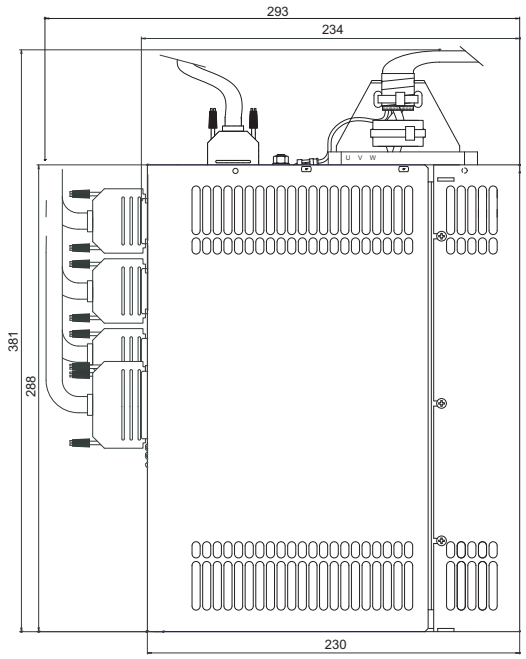
2.2 - XTRAPULS CD1-pm-400/1.8 TO 7.2 A POSITIONER



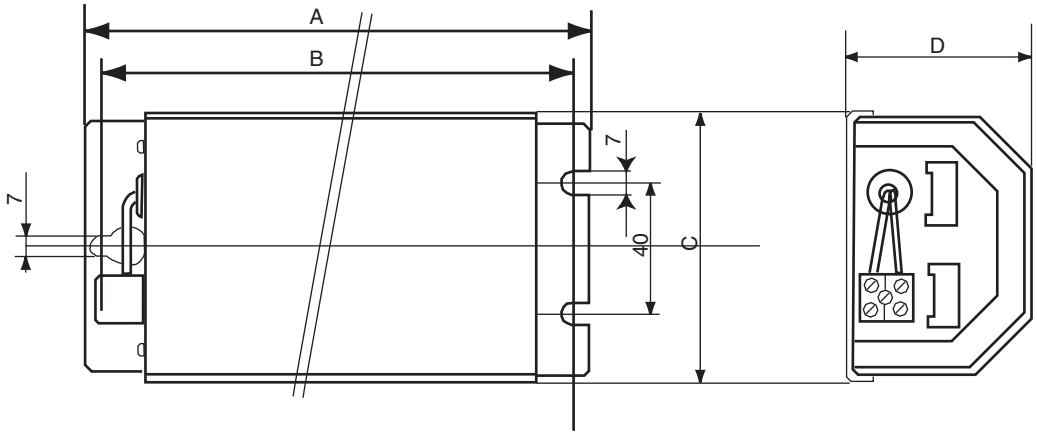
2.3 - XTRAPULS CD1-pm-400/14 A POSITIONER



2.4 - XTRAPULS CD1-pm-400/30/45/70 AND 90 A POSITIONER

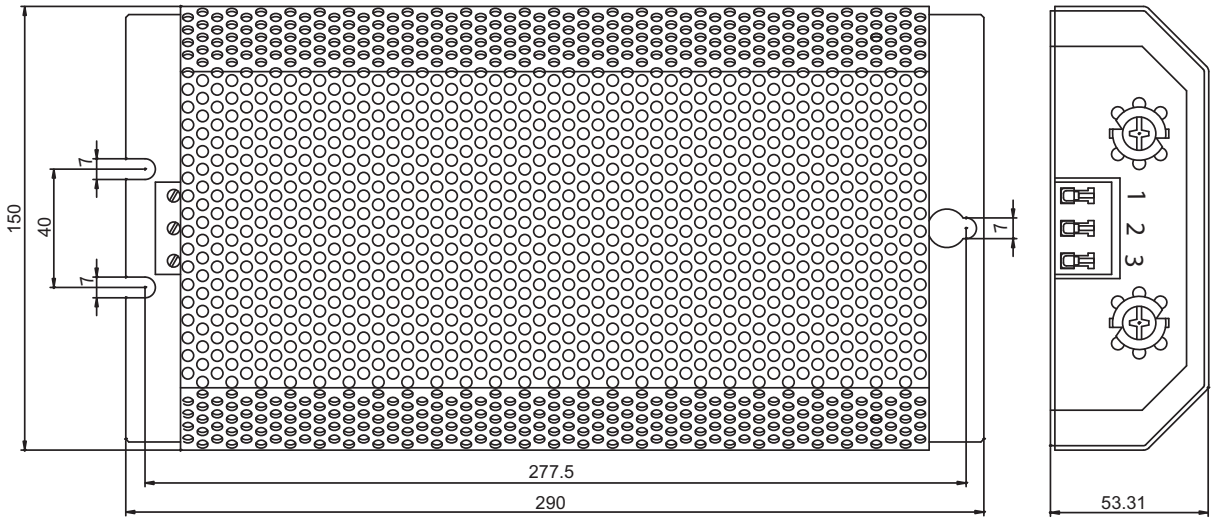


2.5 - BRAKING RESISTOR dp 100/100, dp 200/100, dp 50/200, dp 33/280 and dp 16.5/560



dp 16.5/560

Connection of the braking resistor EF 400, 16.5 Ω/560 W on pins 1 and 3 of the braking resistor connector.

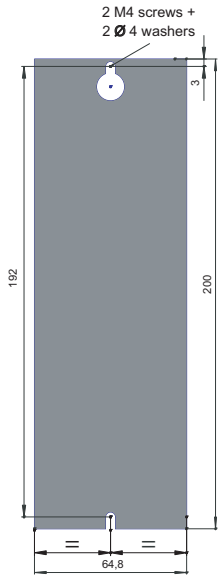


DIMENSIONS	dp 50/200, dp 100/100 and dp 200/100	dp 33/280	dp 16.5/560
A	157 mm	290 mm	290 mm
B	145 mm	278 mm	278 mm
C	83 mm	83 mm	57 mm
D	52 mm	57 mm	145 mm

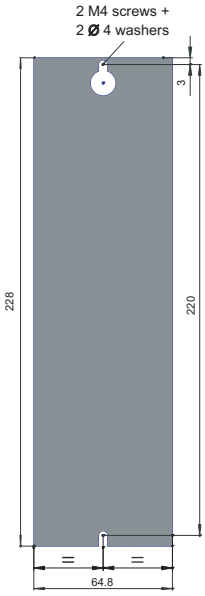
3 - FASTENING

VERTICAL MOUNTING MANDATORY !

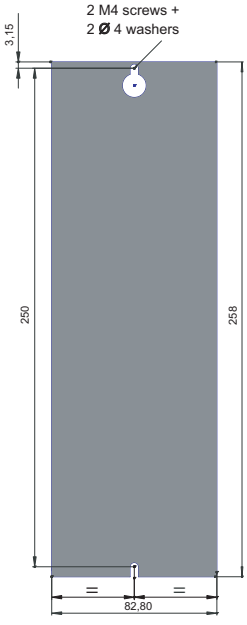
3.1 - XTRAPULS CD1-pm-230/I POSITIONER



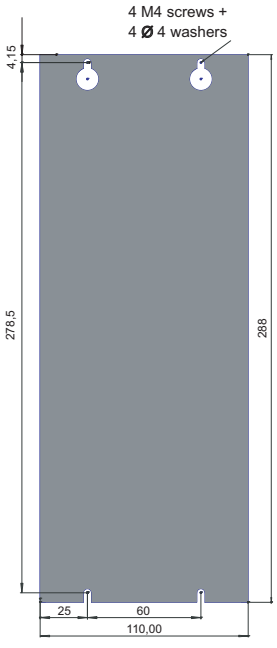
3.2 - XTRAPULS CD1-pm-400/1.8 TO 7.2 A POSITIONER



3.3 - XTRAPULS CD1-pm-400/14 A POSITIONER

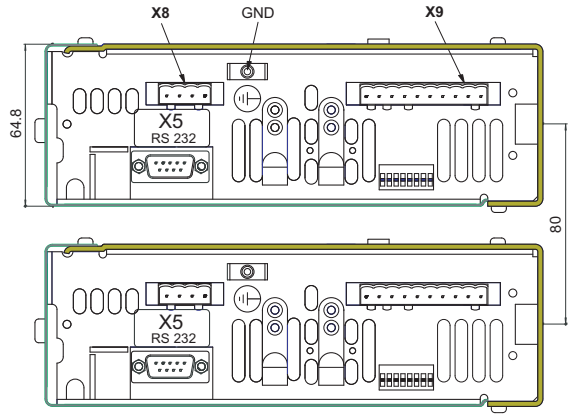


3.4 - XTRAPULS CD1-pm-400/30/45/70 AND 90 A POSITIONER

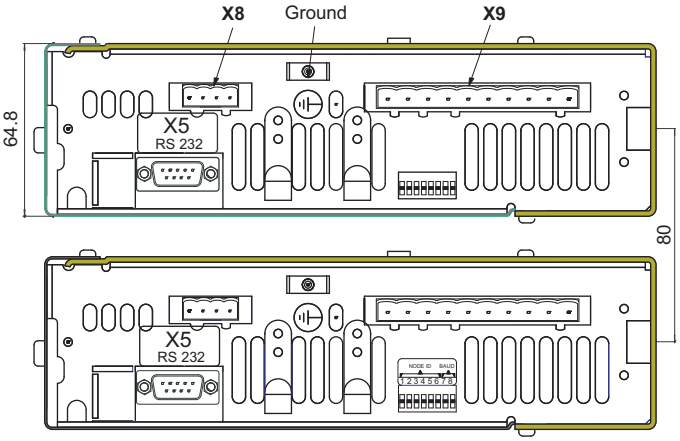


4 – MULTIAXES CABINET MOUNTING

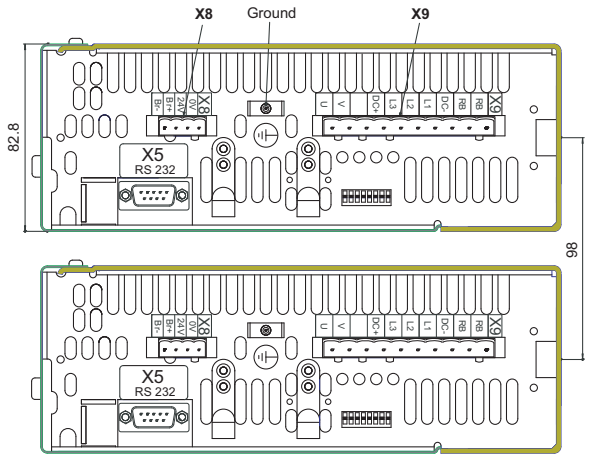
4.1 - XTRAPULS CD1-pm-230/I POSITIONER



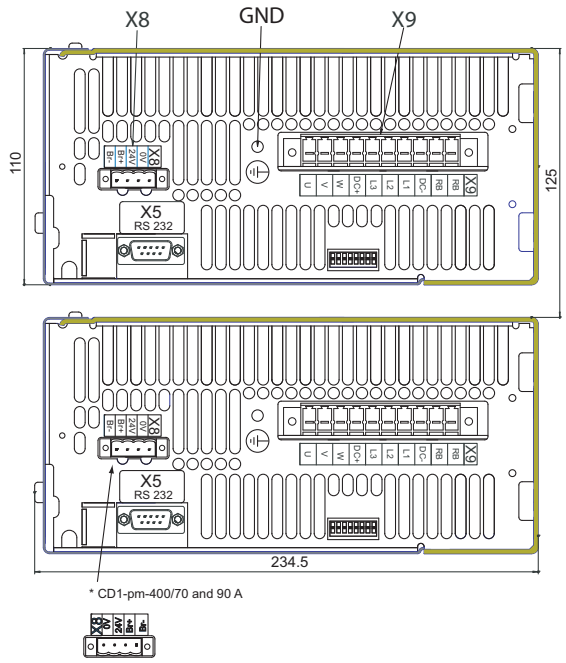
4.2 - XTRAPULS CD1-pm-400/1.8 TO 7.2 A POSITIONER



4.3 - XTRAPULS CD1-pm-400/14 A POSITIONER

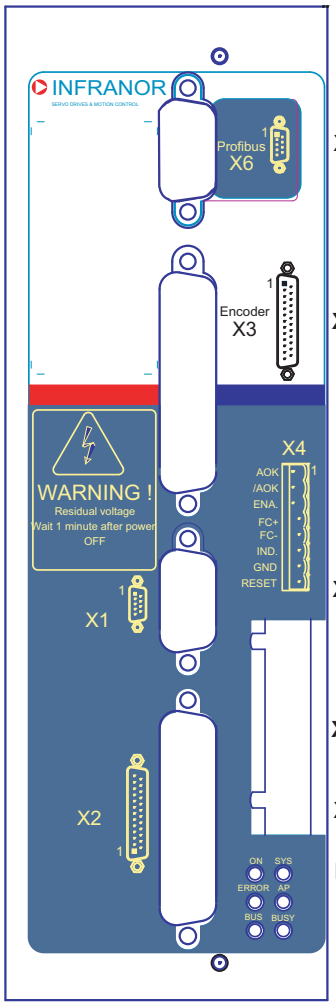


4.4 - XTRAPULS CD1-pm-400/30/45/70 AND 90 A POSITIONER



Chapter 3 - Inputs - Outputs

1 - CONNECTOR LOCATION



X6 Profibus

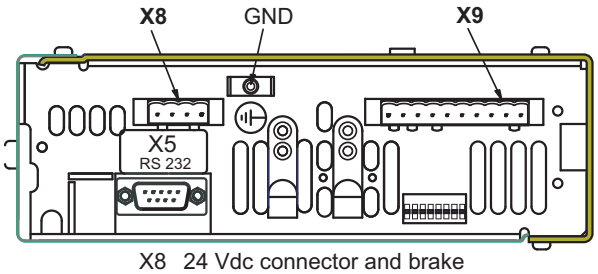
X3 Encoder connector

X1 Resolver connector

X4 Command connector

X2 Digital I/Os connector

LEDs ON (green) SYS (yellow)
ERROR (red) AP (red)
BUS (green) BUSY (yellow)

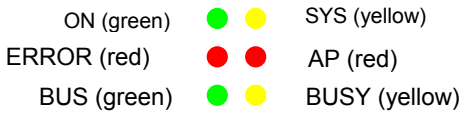


X8 24 Vdc connector and brake
X9 Power connector

2 - LEDs

2.1 – DRIVE FAULT LEDs

Location: below the X4 command connector



ON : power supply
SYS: system fault
ERROR : Faults grouped on "ERROR" Led: These faults are coded and can be displayed by means of the VDSetup software via the serial RS232 link or the Profibus. The "ERROR" Led groups the following faults:

SA:	Power supply overvoltage
CL:	Out of 24 VDC supply range (between 18 and 29 V)
FT:	Phase/ground short-circuit
FD/R:	Braking system short-circuited or overheated
FV:	Fan
FO:	Short-circuit, temperature, power stage supply, PWM error
I^2t:	I^2t protection error
RDC:	Digital resolver converter tracking error
CNT:	Encoder counting error
POS:	Position following error
E2P:	EEPROM error
BUS:	PROFIBUS communication error (or Positioner initialization/configuration error)
BUSY:	Procedure execution error
TMOT:	Motor temperature
RES:	Resolver cable interruption
COD:	Encoder cable interruption
HALL :	Hall Effect Sensors error

BUS:PROFIBUS communication OK.
BUSY: Procedure in progress (blinking).
AP: No power supply. The AOK output does not take into account the display of AP.

All faults (except for the "Undervolt." fault) involve:
- the positioner disabling
- the motor brake control.
- the opening of the AOK relay contact. This relay must be wired as described in section 5.3 for switching off the power supply in order to keep a zero type standstill.

The AP fault involves:
- the positioner disabling
- the motor brake control.

3 - X1: RESOLVER CONNECTOR

Sub D 9 pins female (same for all drive types 230V & 400V)

PIN	FUNCTION	REMARKS
1	TC (thermal sensor)	If thermal switch connected to X1
6	Shield connection	The shield must have a 360° connection on the connector metal cover. This connection can be completed by connecting the wires to pin 1.
2	TC (thermal sensor)	If thermal switch connected to X1
7	S1 (cosine-)	Resolver connector
3	S3 (cosine+)	Resolver connector
8	S4 (sine-)	Resolver connector
4	S2 (sine+)	Resolver connector
9	R2 (reference-)	Resolver connector
5	R1 (reference+)	Resolver connector

For other resolver connections, see chapter 5 (Appendix) , section 2.

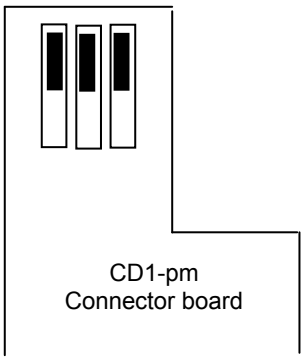
4 – X2: DIGITAL I/Os CONNECTOR

Sub D 25 pins male (same connector for all drive types in 230 V and 400 V)

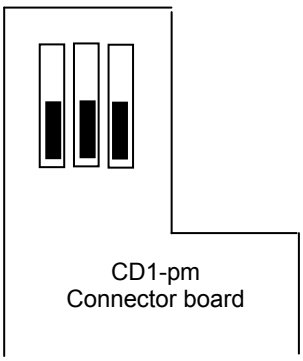
Pins	I/O	Description
1	I	Optocoupled input "**START**"
2	I	Optocoupled input "**STOP**"
3	I	Optocoupled input **IN1**
4	O	Z/
5	O	Z
6	O	A/
7	O	A
8	O	B/
9	O	B
10	I	Optocoupled input **IN2**
11	I	Optocoupled input **IN3**
12	I	0 V external
13	I	Optocoupled input **IN4**
14	I	Optocoupled input **IN5**
15	I	Optocoupled input **IN6**
16	O	Isolated output **SEQ**
17	O	Isolated output **POS**
18	O	Isolated output **SPEED**
19	O	Isolated output **OUT1**
20	O	Isolated output **OUT2**
21	O	Isolated output **OUT3** (**) Configurable analog input by jumpers
22	O	Isolated output **OUT4** (**) Configurable analog output by jumpers
23	O	0 V internal
24	I	External supply +24 V (*)
25	I	0 V external

(*) +24 V input only required when the outputs **SEQ**, **POS**, **SPEED**, **OUT1**, **OUT2**, **OUT3**, **OUT4** are used.

(**) The analog input and the analog output are configured by the 3 jumpers located on the drive connector board as described below.

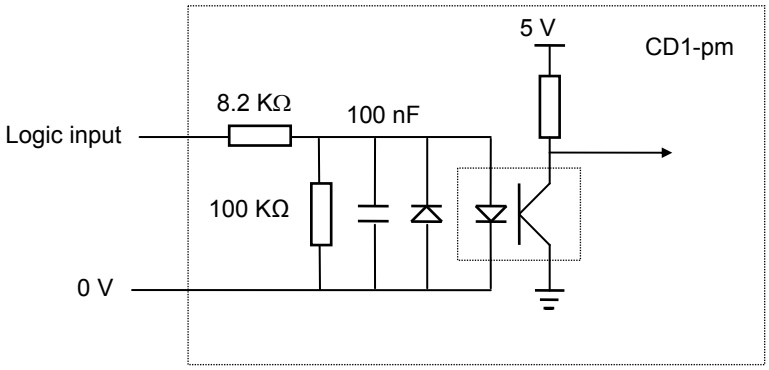


Logic outputs selection



Analog I/Os selection

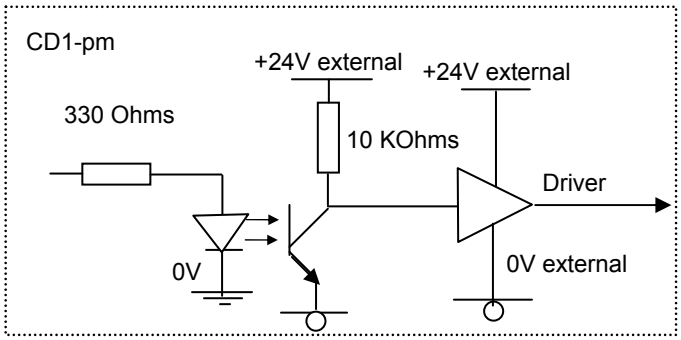
SPECIFICATIONS OF THE LOGIC INPUTS : IN1 to IN6



The input voltage corresponding to level 1 is between 18 V and 30 V

These inputs are optocoupled and work in positive logic.

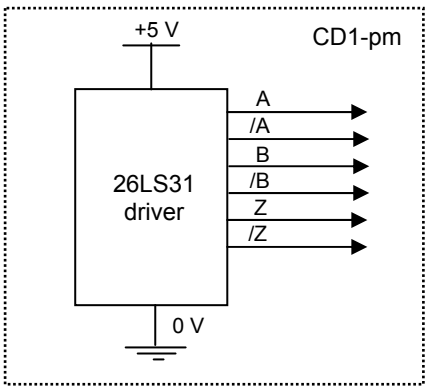
SPECIFICATIONS OF THE LOGIC OUTPUTS : SEQ, POS, SPEED, OUT1 to OUT4



- External supply +24 V (18 V < U < 30 V)
- Maximum voltage drop = 2 V
- Protection against overloads
- Output current available per output (mA)

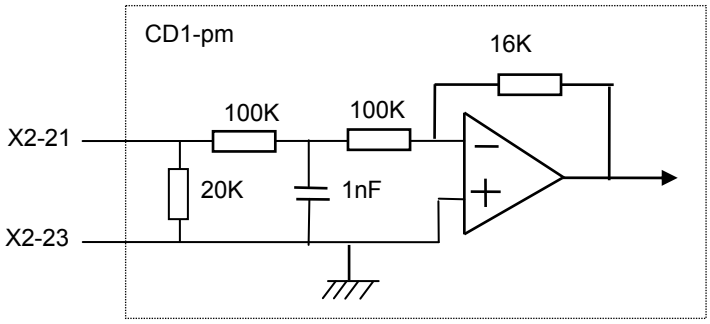
Number of activated outputs \ Cyclic rate (%)	100%	70%	50%	30%
2	200 mA	200 mA	200 mA	200 mA
4	100 mA	150 mA	200 mA	200 mA
7	60 mA	80 mA	120 mA	200 mA

SPECIFICATIONS OF THE ENCODER OUTPUTS

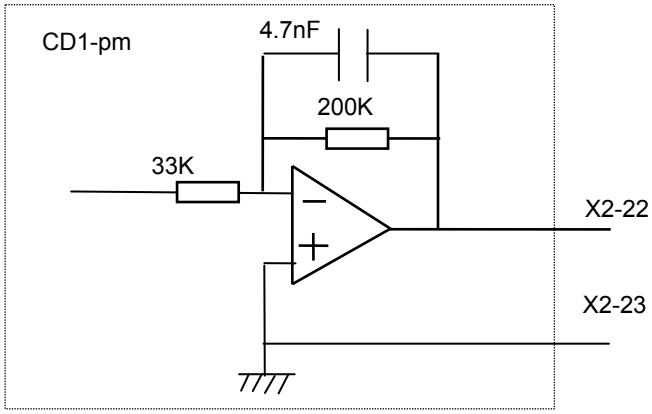


Recommended receiver: 26LS32

SPECIFICATIONS OF THE ANALOG INPUT



SPECIFICATIONS OF THE ANALOG OUTPUT



5 – X3: ENCODER CONNECTOR

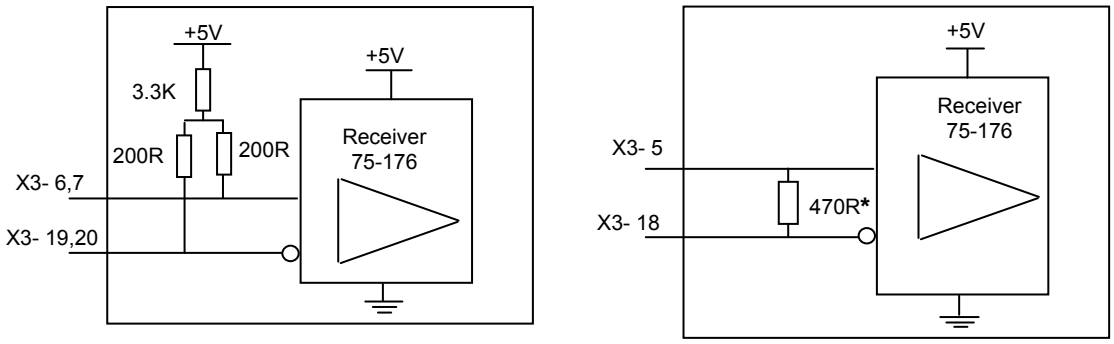
Sub D 25 pins female (same connector for all drive types in 230 V and 400 V)

5.1 - X3 CONNECTOR FOR TTL INCREMENTAL ENCODER & HES INPUT (Sub D 25 pins female)

The “TTL incremental encoder & HES” configuration is selectable by software and stored in the drive EEPROM. The corresponding X3 connector pin function is described below.

PIN	FUNCTION	REMARKS
18	Marker Z/	Differential input of the encoder marker pulse Z/
5	Marker Z	Differential input of the encoder marker pulse Z
19	Channel A/	Differential input of the encoder channel A/
6	Channel A	Differential input of the encoder channel A
20	Channel B/	Differential input of the encoder channel B/
7	Channel B	Differential input of the encoder channel B
8	+5 V	Encoder supply voltage (300 mA max. current)
21	GND	Encoder supply GND
11	HALL U	Hall sensor input signal phase U
24	HALL V	Hall sensor input signal phase V
12	HALL W	Hall sensor input signal phase W
10	+12 V	Hall sensors supply voltage: output impedance = 9 Ω, max 150 mA available
23	AGND	Hall sensors supply GND
9	TC+	Motor thermal sensor input
22	TC-	Motor thermal sensor input
others	reserved	

ENCODER INPUT LINES SPECIFICATION

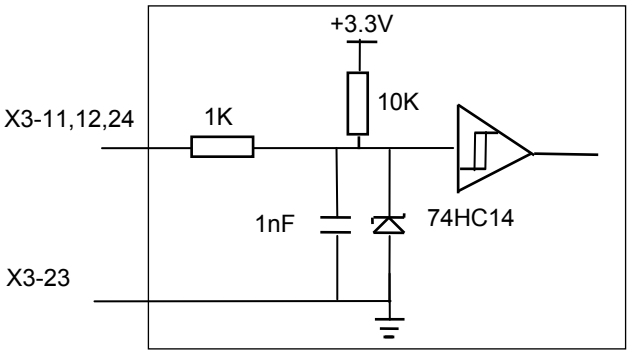


(*)The 470 Ω resistor is wired as from index:

CD1-pm	230	400/1,8 to 7,2 A	400/14 A	400/30 to 45 A	400/70 to 90 A
	αk	αk	αk	X	D

There is no braking resistor on the former versions.

SPECIFICATION OF THE HALL SENSORS INPUT LINES

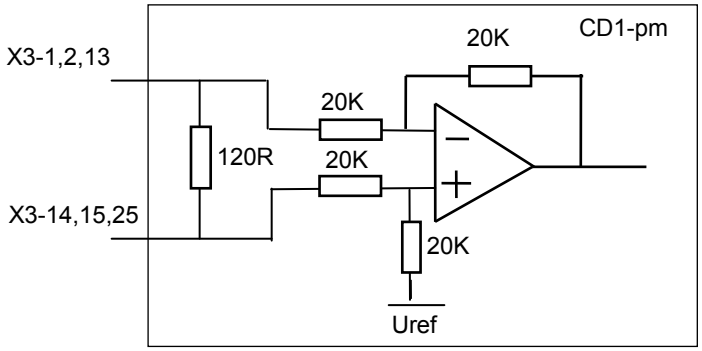


5.2 - X3 CONNECTOR FOR SinCos INCREMENTAL ENCODER & HES INPUT (Sub D 25 pins female)

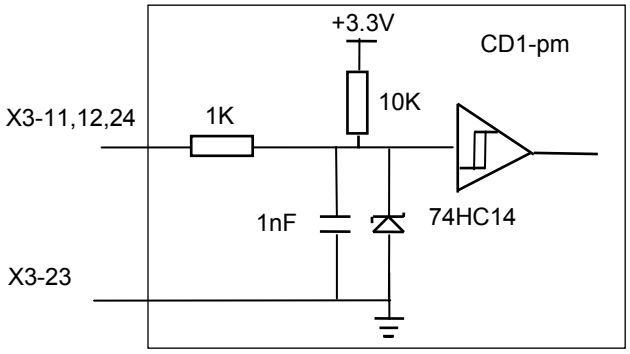
The “SinCos incremental encoder & HES” configuration is selectable by software and stored into the drive EEPROM. The corresponding X3 connector pin functions are described below.

PIN	FUNCTION	REMARKS
25	Marker R/	Differential input of the Sin/Cos encoder reference pulse R/
13	Marker R	Differential input of the Sin/Cos encoder reference pulse R
14	Channel A/	Differential input of the Sin/Cos encoder channel A/
1	Channel A	Differential input of the Sin/Cos encoder channel A
15	Channel B/	Differential input of the Sin/Cos encoder channel B/
2	Channel B	Differential input of the Sin/Cos encoder channel B
8	+5V	Encoder supply voltage (300 mA max. current)
21	GND	Encoder supply GND
11	HALL U	Hall sensor input signal phase U
24	HALL V	Hall sensor input signal phase V
12	HALL W	Hall sensor input signal phase W
10	+12V	Hall sensors supply voltage: output impedance = 9 Ω, max 150 mA available
23	AGND	Hall sensors supply GND
9	TC+	Motor thermal sensor input
22	TC-	Motor thermal sensor input
others	reserved	

SPECIFICATION OF THE SIN/COS ENCODER CHANNELS



SPECIFICATION OF THE HALL SENSORS INPUT LINES



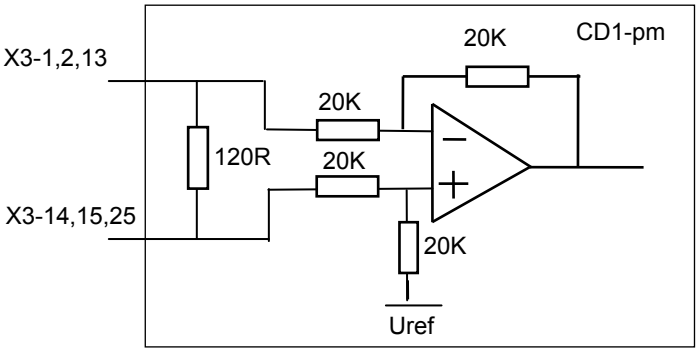
5.3 - X3 CONNECTOR FOR ABSOLUTE SINGLE TURN SIN/COS ENCODER (Sub D 25 pins female)

The “Absolute single-turn SinCos encoder” configuration (for Heidenhain ERN 1085 or compliant) is selectable by software and stored in the drive EEPROM.

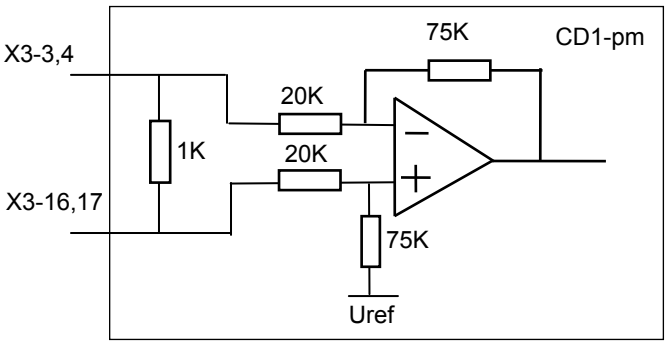
The corresponding X3 connector pin functions are described below.

PIN	FUNCTION	REMARKS
25	Marker R/	Differential input of the Sin/Cos encoder reference pulse R/
13	Marker R	Differential input of the Sin/Cos encoder reference pulse R
14	Channel A/	Differential input of the Sin/Cos encoder channel A/
1	Channel A	Differential input of the Sin/Cos encoder channel A
15	Channel B/	Differential input of the Sin/Cos encoder channel B/
2	Channel B	Differential input of the Sin/Cos encoder channel B
16	Channel C/	Differential input of the Sin/Cos encoder channel C/
3	Channel C	Differential input of the Sin/Cos encoder channel C
17	Channel D/	Differential input of the Sin/Cos encoder channel D/
4	Channel D	Differential input of the Sin/Cos encoder channel D
8	+5V	Encoder supply voltage (300 mA max. current)
21	GND	Encoder supply GND
9	TC+	Motor thermal sensor input
22	TC-	Motor thermal sensor input
others	reserved	

SPECIFICATION OF THE SIN/COS ENCODER CHANNELS



SPECIFICATION OF THE SIN/COS COMMUTATION CHANNELS



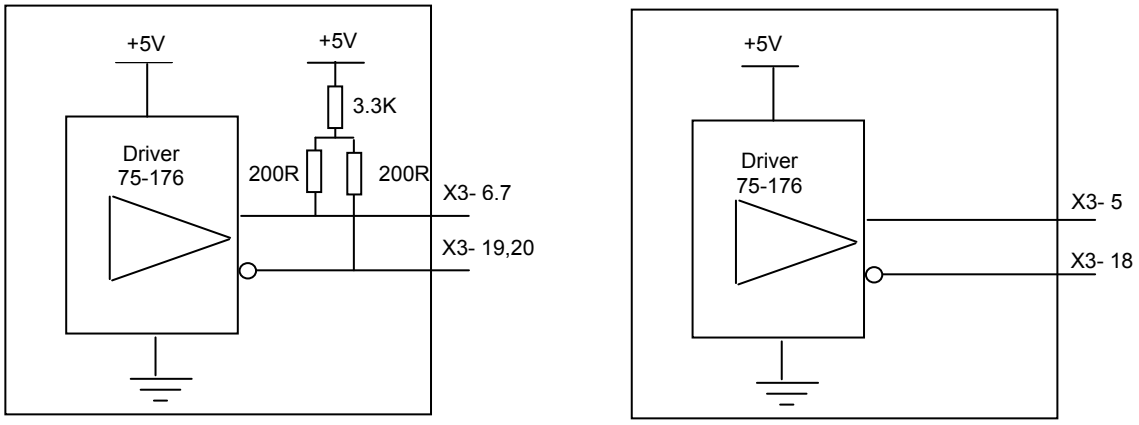
5.4 - X3 CONNECTOR FOR ENCODER OUTPUT (Sub D 25 pins female)

At power on, the differential channels A, B and Z are configured as encoder inputs. The configuration as encoder outputs must be enabled via the PROFIBUS bus.

The corresponding X3 connector pin functions are described below.

PIN	FUNCTION	REMARKS
19	Channel A/	Differential output of channel A/
6	Channel A	Differential output of channel A
20	Channel B/	Differential output of channel B/
7	Channel B	Differential output of channel B
18	Marker Z/	Differential output of channel Z/
5	Marker Z	Differential output of channel Z
21	GND	0 V reference of the drive
others	reserved	

SPECIFICATION OF THE ENCODER OUTPUT SIGNALS



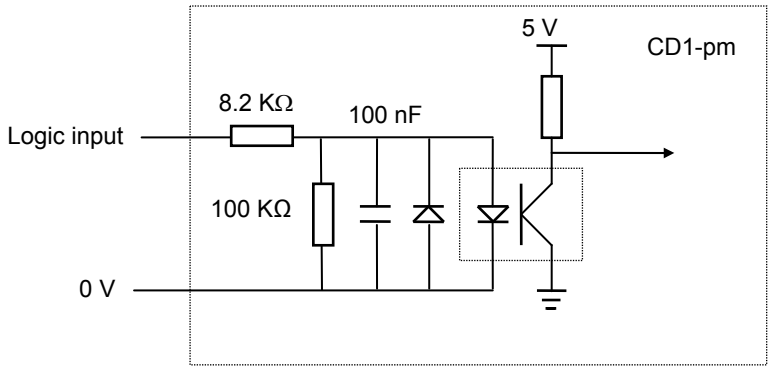
6 - X4: COMMAND CONNECTOR

8 pins male connector (with 5.08mm pitch) - Same connector for all drive types in 230 V and 400 V.
Female connector supplied.

Fastening torque of the connector screws: 0,5 Nm.

PIN	SIGNAL	I/O	REMARK
1, 2	AOK and AOK/	O	Relay contact: closed when drive OK Pmax = 10 W with Umax = 50 V or Imax = 100 mA
3	ENABLE	I	Positive optocoupled logic
4	Limit switch +	I	Positive optocoupled logic
5	Limit switch -	I	Positive optocoupled logic
6	INDEX	I	Positive optocoupled logic
7	GND: 0 V of logic inputs	I	Potential reference of the optocoupled (galvanic isolated) logic inputs. This potential reference may be different from the auxiliary supply
8	RESET	I	Positive optocoupled logic : Inhibition of the faults memory stored in the drive

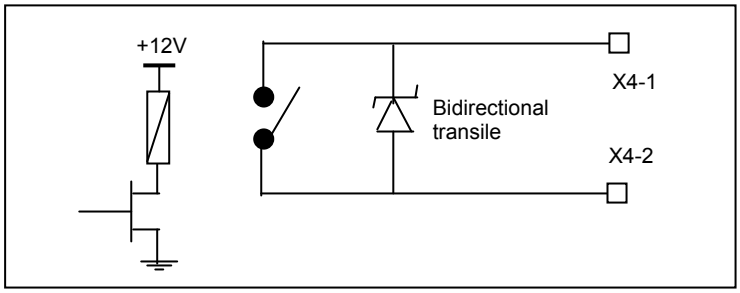
6.1 - SPECIFICATIONS OF THE LOGIC INPUTS: FC+, FC-, INDEX, ENABLE, RESET



The input voltage corresponding to level 1 is between 18 V and 30 V

These inputs are optocoupled and work in positive logic.

6.2 - SPECIFICATION OF THE "AOK" LOGIC RELAY OUTPUT



Relay contact: closed if drive ready, open if fault.
Pmax = 10 W with Umax = 50 V and Imax = 100 mA.

7 - X5: RS-232 CONNECTOR

Sub-D 9 pins male (same connector for all drive types in 230 V and 400 V)

PIN	FUNCTION	REMARK
5	0 Volt	GND (360° shield connection if no 360° connection on the connector)
3	TXD	Transmit data RS-232
2	RXD	Receive data RS-232

8 - X6: PROFIBUS

Sub-D 9 pins female (same for all drive types 230V & 400V)

PIN	SIGNAL	DESCRIPTION
1	Shield	Shield
2		
3	RxD/TxD-P	Data Reception/Transmission (Plus)
4	CNTR-P	Control signal
5	DGND	0 V
6	VP	Supply for termination resistor
7		
8	RxD/TxD-N	Data Reception/Transmission (Minus)
9		

9 - X8: AUXILIARY SUPPLY AND BRAKE CONNECTOR

4 pins male connector (with 5.08 mm pitch). Same connector for all drive types in 230 V and 400 V.
Female connector supplied.

Fastening torque of the connector screws: 0.5 Nm

PIN	SIGNAL	I/O	FUNCTION	DESCRIPTION	
1	GND	I	Potential reference of the 24VDC supply	GND = grounded potential reference	
2	+24 VDC	I	24 VDC auxiliary supply mains isolated	24 VDC +/-15% - 0.4 A without brake Regulation with load: 3%	UL: Protection by UL 4 A fuse.
3	Brake + 24 V	O	Motor brake supply with 24 VDC	Powerless brake: 24 VDC / 1.5 A	
4	Brake -	O	Direct motor brake control Imax = 1.5A	Open collector output protected against load short-circuits	

10 - X9: POWER CONNECTOR: MAINS, MOTOR, BRAKING RESISTOR (CD1-pm-230 V & 400 V)

Xtrapuls CD1-pm-230/I: 10 pins male connector (with 5.08 mm pitch). Female connector supplied.
Xtrapuls CD1-pm-400/I: 10 pins male connector (with 7.62mm pitch). Female connector supplied.
Xtrapuls CD1-pm-400/70 and 90: 10 pins male connector (with 10.16 mm pitch).
Female connectors supplied in 2 parts: 7 pins female, pins 1 to 7 and 3 pins female, pins 8 to 10 for the motor.

Fastening torque of the connector screws: 0.5 Nm

PIN	SIGNAL	I/O	FUNCTION	DESCRIPTION
1	RB	O	Power feedback during the motor deceleration with high inertia and speed	CD1-pm-230/I: 100 Ohms/100W (dp 100/100) CD1-pm-400/1.8 to 7.2: 200 Ohms/100W (dp 200/100) CD1-pm-400/14: 50 Ohms/200 W (dp 50/200) CD1-pm-400/30/45: 33 Ohms/280 W (dp 33/280) CD1-pm-400/70 and 90: 16.5 Ohms/560W (dp 16.5/560) (Braking resistors must be separately ordered)
2	RB	O		
3	DC-	I/O	Parallel connection of the DC bus	Only on UL listed items.
4	L1	I	Mains input	CD1-pm-230/I 230 VAC 1~ or 3~ CD1-pm-400/I 400 to 480 VAC 3~
5	L2	I		
6	L3	I		
7	DC+	I/O	Parallel connection of the DC bus	Only on UL listed items.
8	W	O	Motor phase W	Motor cable with grounded connection by means of Faston socket and 360° shield connection on grounded collar
9	V	O	Motor phase V	
10	U	O	Motor phase U	

IMPORTANT: The motor and brake cable must be shielded and connected over 360° on collars mounted for this purpose on the housing. The ground wire of the motor cable MUST be connected to the Faston socket marked with the GND sign.
The earth reference must also be connected on the second Faston socket.

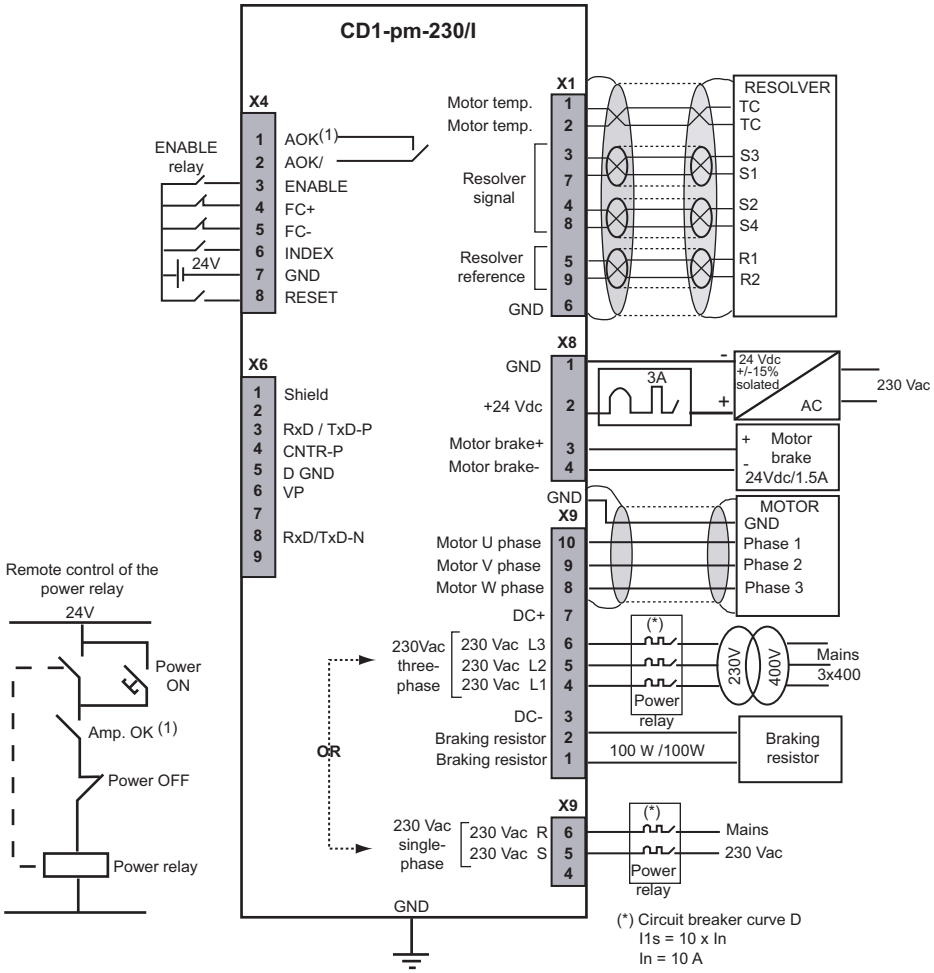
- The installer of the drives has to use a UL Listed Quick connect for ground connection (0.250 inches or 6.35 mm wide nominal).
- Field wiring terminals have to use copper conductors only.
  Torque value for field wiring terminals: value to be according to the Recognized terminal block used.

Chapter 4 - Connections

1 - CONNECTION DIAGRAMS

1.1 – XTRAPULS CD1-pm-230/I POSITIONER

(For the UL compliant connection, see chapter 4, section 3.4).

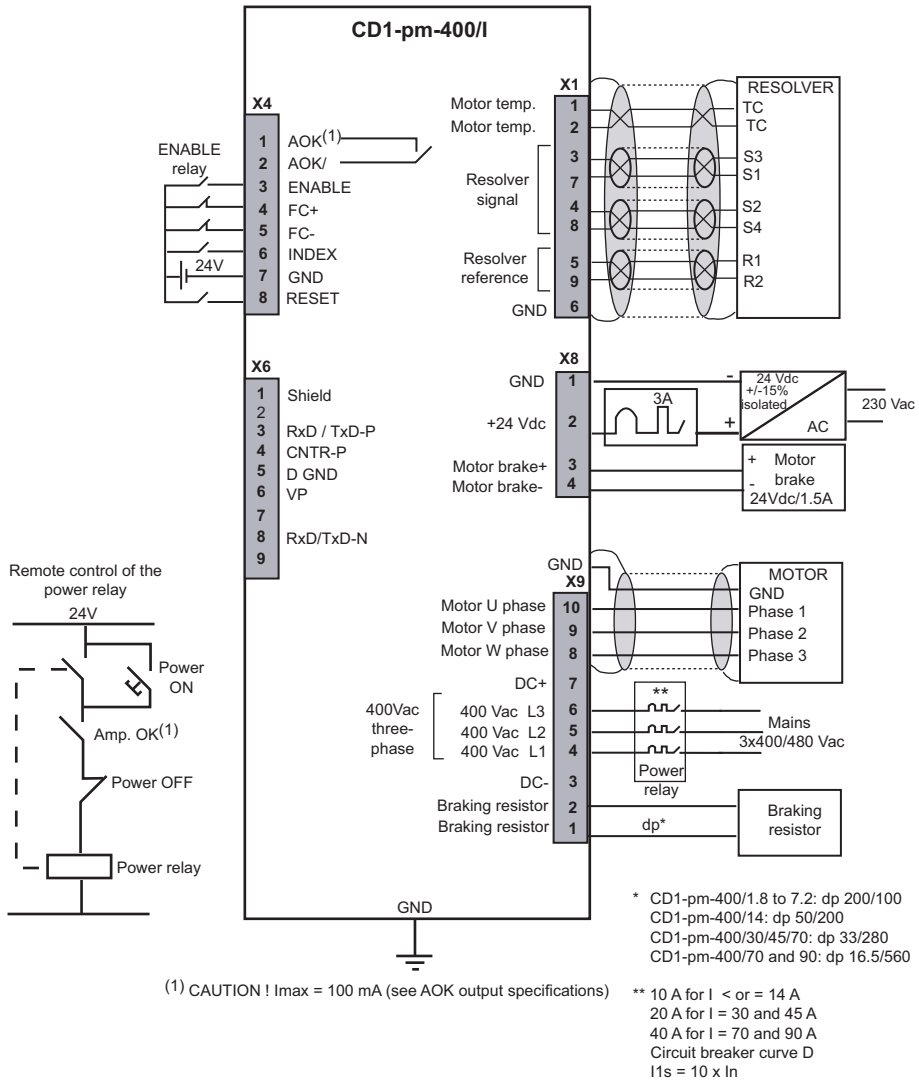


(1) CAUTION ! Imax = 100 mA (See AOK output specifications)

<u>Note</u>: The 24 V and power supplies protection, on source side, must be made by the user.

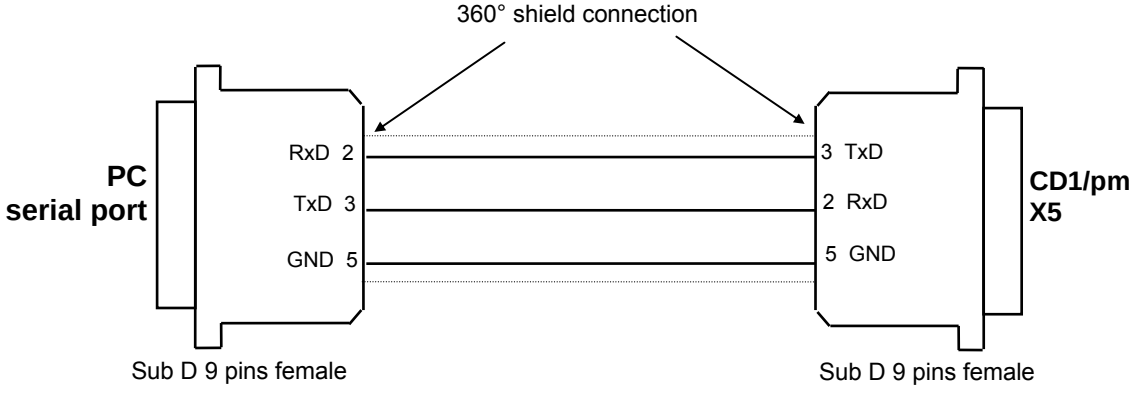
1.2 – XTRAPULS CD1-pm-400/I POSITIONER

See chapter 4, section 3.5 for the UL compliant connection

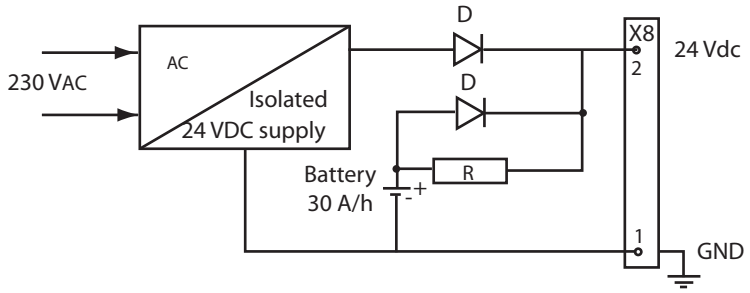


<u>Note</u>: The 24 V and power supplies protection, on source side, must be made by the user.

1.3 – SERIAL LINK CONNECTION

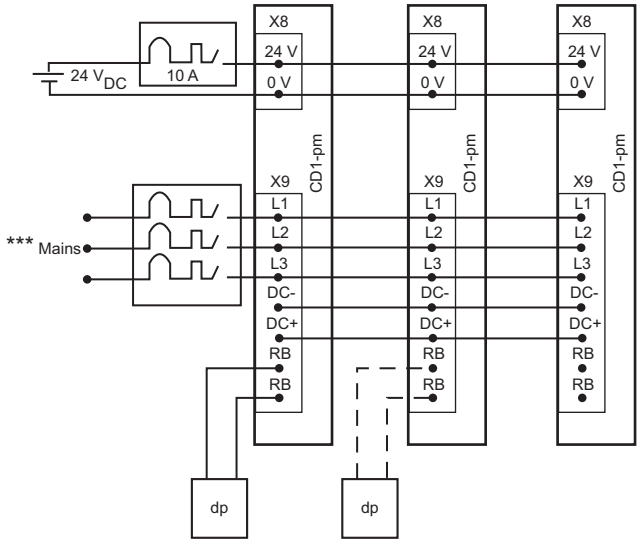


1.4 – CONNECTION OF A BACKUP BATTERY FOR THE 24 VDC AUXILIARY SUPPLY



The Xtrapuls CD1-pm positioner consumption is 320 mA with 24VDC. So, a 24 V / 30 A/h battery can keep the positioner under voltage during i.e. a long 3 days week-end or during a mains cut-off without loosing the machine initialization. This backup method is very interesting for saving the machine initialization as well as the axis position even when moving with mains switched off. An ASCII command allows to send the axis position to the digital host system.

1.5 – CONNECTION EXAMPLE FOR A MULTIAXIS APPLICATION



*** CD1-pm-230/I : 3 x 230 V
CD1-pm-400/I : 3 x 400 V
Circuit breaker curve D
I1s = 10 x In

For a multiaxis application with n drives, the circuit breaker current rating is given by the formula:

$In = 0{,}3 \sum_{1}^{n} I$ rated amplifier

But, the current rating of the circuit breaker must not exceed:
- 20 A on 230 V drives,
- 20 A on 400 V / 1.8 to 14 A drives,
- 40 A on 400 V / 30 A and 45 A drives,
- 60 A on 400 V / 70 A and 90 A drives.

2 - WIRING RECOMMENDATIONS

(according to EN61000.4-2-3-4-5 and EN55011 standards - see diagram "Shield connection on the connectors " – chapter 4, section 2.2).

2.1 – GROUND CONNECTIONS AND GROUNDING

CAUTION
Each potential conducting element must be **shielded**. Several potential conductors **in the same sleeve** must be **twisted and shielded**.

A shield has no effect if it is not connected:
- to a reference potential,
- by a connection as short as possible (a few centimeters; 10 centimeters is prohibited),
- by a "360°" shield connection. This means that the whole circumference of the shield sleeve must be connected to the reference conduction via a metal collar.

The connectors used for the compliance with the EN61000.4 standard must be made of metal or metallized and must allow the 360° shield connections.
Reference potential connections (especially with the ground) are recommended **only** these connections have a very low impedance (< 0,1 Ω). Any shield that is not used as a conductor can be connected at both ends with the condition to be connected over 360° at both ends by means of metal links in order to ensure the shield continuity.

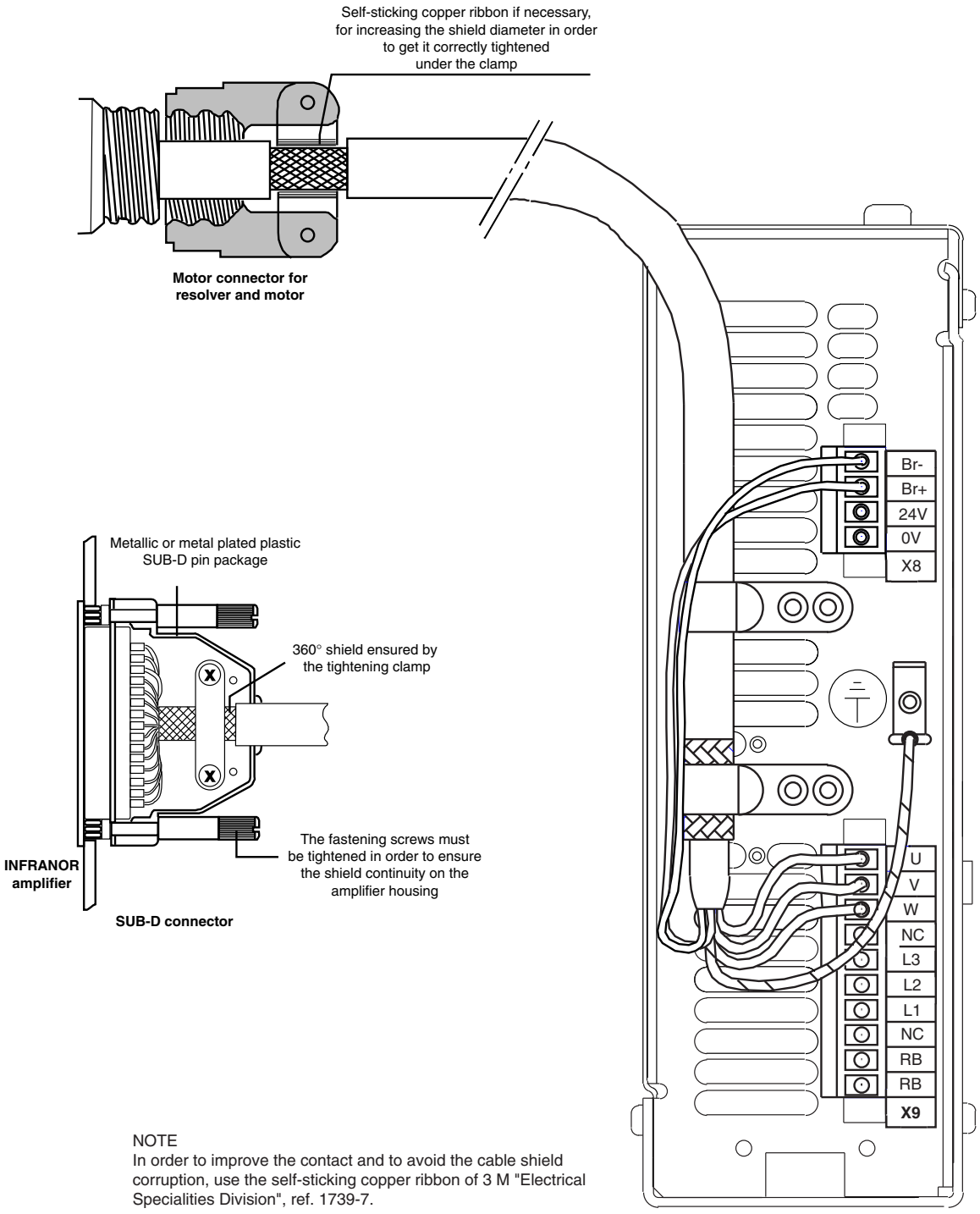
The reference potential must be the ground.

Cables with low potential should **never** run in the proximity of high power lines.

If there is a potential reference, i.e. a main chassis or cabinet with a low impedance between its different elements, it should be used to connect ALL reference to it and also being grounded itself.

2.2 – CONNECTORS SHIELD CONNECTION

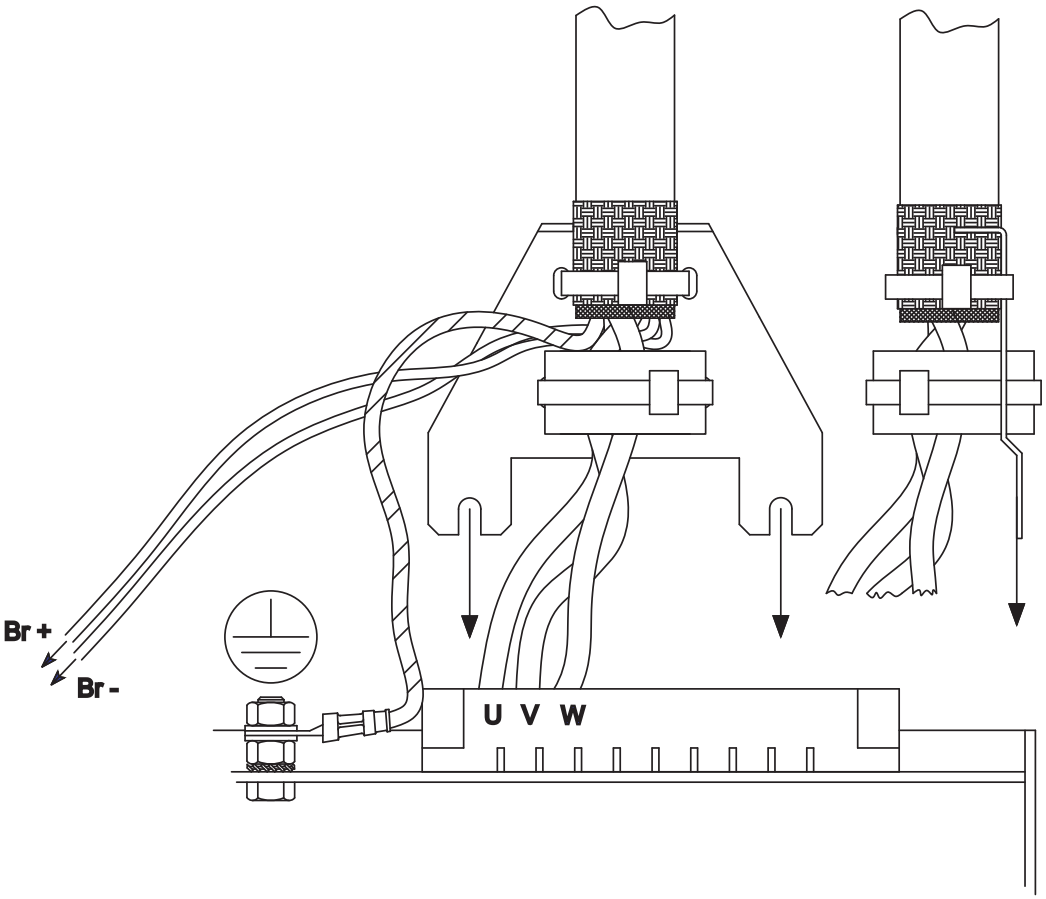
RULE
The shield should never be interrupted or corrupted over the whole cable length.



NOTE
In order to improve the contact and to avoid the cable shield corruption, use the self-sticking copper ribbon of 3 M "Electrical Specialities Division", ref. 1739-7.

NOTE
When the 360° shield connection is made by means of a collar, it is not necessary to connect a cable on the appropriate pin of the SUB-D connector.

2.3 – CONNECTION VIEW OF XTRAPULS CD1-pm-400/30/45/70 and 90 A



Maximum tightening torque of the ground connection: 3.6 Nm.

2.4 - MOTOR, RESOLVER AND ENCODER CABLES

Motors, resolvers and encoders are grounded via their housing.
Cable inputs must be made by means of metal connectors with collars allowing the 360° shield connection.

The resolver cable must be pair twisted and shielded (sin, cos, ref.). Motor cables MUST also be shielded and connected over 360° at both ends as shown on the shield connection diagram.

The encoder inputs A, B, C, D, Z and R require a pair twisted and shielded cable. The shield must have a "360°" connection via metallic collars at both ends. If the shield is connected by means of a pig tail, it must be connected at one end to the GND pin of the connector on the drive side with a connection as short as possible.

Check that the voltage drop in the power supply lines of the encoder cable is complying with the technical specifications of the encoder. The voltage drop value for a given cable is calculated as follows:

$$\Delta U[V]=40.10^{-6}.\frac{L_C[m].I[mA]}{S[mm^2]}$$

with
- ΔU: voltage drop in volts
- Lc: cable length in meters
- I: encoder current in milliamps (see technical specifications)
- S: cross section in square millimeters

Due to this voltage drop:

- an encoder with a large power supply voltage range should be preferred,
- if the encoder has got power supply SENSE feedback lines, they can be connected to the power supply lines in order to reduce the voltage drop by the half (the SENSE feedback signal is not used in the Xtrapuls CD1 range),
- if none of both solutions above can be used, the user has to supply the encoder by means of an external power supply.

Example

The application requires an Heidenhain linear encoder supplied by 5 V ±5 % / 300mA with 25 m cable length.
Min. power voltage: 5 V ±5 % ⇨ ΔU_{max} = 0.25 V ⇨. Min. cross section: S = 1.2 mm².
Such a large cross section is difficult to obtain, so the user can:

- either connect the SENSE feedback signal lines with power supply lines, while the needed wires cross section will be the half (0.6 mm²),

- or use the same encoder type but the version which allows its power supply voltage from 3.6 V to 5.25V / 300mA. Min power voltage 3.6V ⇨ ΔU_{max} = 1.4V ⇨. Min. cross section : S = 0.21mm²

The cables of brake equipped motors must also have their brake cables shielded in order to be EMC compliant.

Maximum cable length: - resolver: ≤ 100 m
- encoder: ≤ 25 m
- motor: ≤ 25 m

For motor cable length > 25 m, we advise:

- to use the maximum cable section allowed by the connectors,

- to mount a reactance with an inductive value between 1% and 3% of the motor inductive value. The reactance inductive value must be taken into account in the calculation of the current loops. The current rating of the reactance must be equal to or higher than the drive rating.

The reactance must be mounted at the drive output.
Due to the use of a reactance, a shielded cable is not mandatory anymore.
A more complex sinus filter type FN510 by Schaffner may also be mounted instead of the reactance.

UNDESIRABLE EFFECTS OF MOTOR CABLES LONGER THAN 25 m:

- Heating of the power module, the motor and the cable.

- High overvoltages on the motor windings involving a shortening of their life time.

The reactance reduces the undesirable effects on motor and drive but it may be quite heated. This requires an appropriate fan.

2.5 - SERIAL LINK CABLES

The serial link cable must also be shielded according to the above mentioned shield connection recommendations.

CAUTION
Command cables (resolver, serial link, Profibus) as well as the power cables must be connected and disconnected with the positioner OFF.

Reminder: The power voltage can remain several minutes on the capacitors terminals.
A contact under high voltage may involve severe physical damage.

2.6 – CONNECTION CABLES OF THE BRAKING RESISTOR

The connection cable to the braking resistor housing must bear the high voltage and temperature of 600 V and 105° C.
Recommended cable: UL 1015 gauge 14.
Fastening torque on the connector of the braking resistor housing: dp = 0.9 Nm.

3 - REQUIREMENTS OF COMPLIANCE WITH THE UL STANDARDS

The UL listing requires the following conditions to be fulfilled by the installer of the drives.

3.1 – CONNECTION BY MEANS OF FASTON SOCKET

The installer must use a UL listed quick connect for ground connections (0.250 inches or 6.35 mm wide nominal) on all drives equipped with FASTON sockets.
On drives equipped with a screwed ground connector, the connection must be made via UL listed sockets.

3.2 – 24 V SUPPLY

The end user has to provide a 24 VDC isolated power supply (e.g. with isolated transformer) for the auxiliary supply input, protected by a 4 A UL listed fuse.

3.3 – POWER SUPPLY AND UL FUSE RATING

The fuse type recommended for motor applications is of class RK5. The maximum short-circuit power of the mains must not exceed 5000 Arms at a voltage of 480 V, when protected by a UL fuse of type RK5 and A60Q40 for 400/70 and 400/90 ratings.

On Xtrapuls CD1-pm-400/I drives, the fuse ratings must be the following:

CD1-pm	400/1.8 to 7.2	400/14	400/30 and 45	400/70 and 90	Multiaxis
BUSSMANN Class RK5 Type FRS-R	FRS-R-4	FRS-R-8	FRS-R-20	FERRAZ A60Q40	$0,3 \times \sum_{1}^{N} I_{\text{rated amplifier}}$
LITTELFUSE Class RK5 Type FLSR-ID	FLSR2ID	FLSR8ID	FLSR20ID	FERRAZ A60Q40	$0,3 \times \sum_{1}^{N} I_{\text{rated amplifier}}$

For a multiaxis application with N drives, the fuse rating is calculated by the formula given in the table above. But a rating of 20 A must not be exceeded on 400/1.8 A to 14 A drives and 40 A must not be exceeded on 400/30/45/70 A and 90 A drives (see chapter 4, section 3.6).

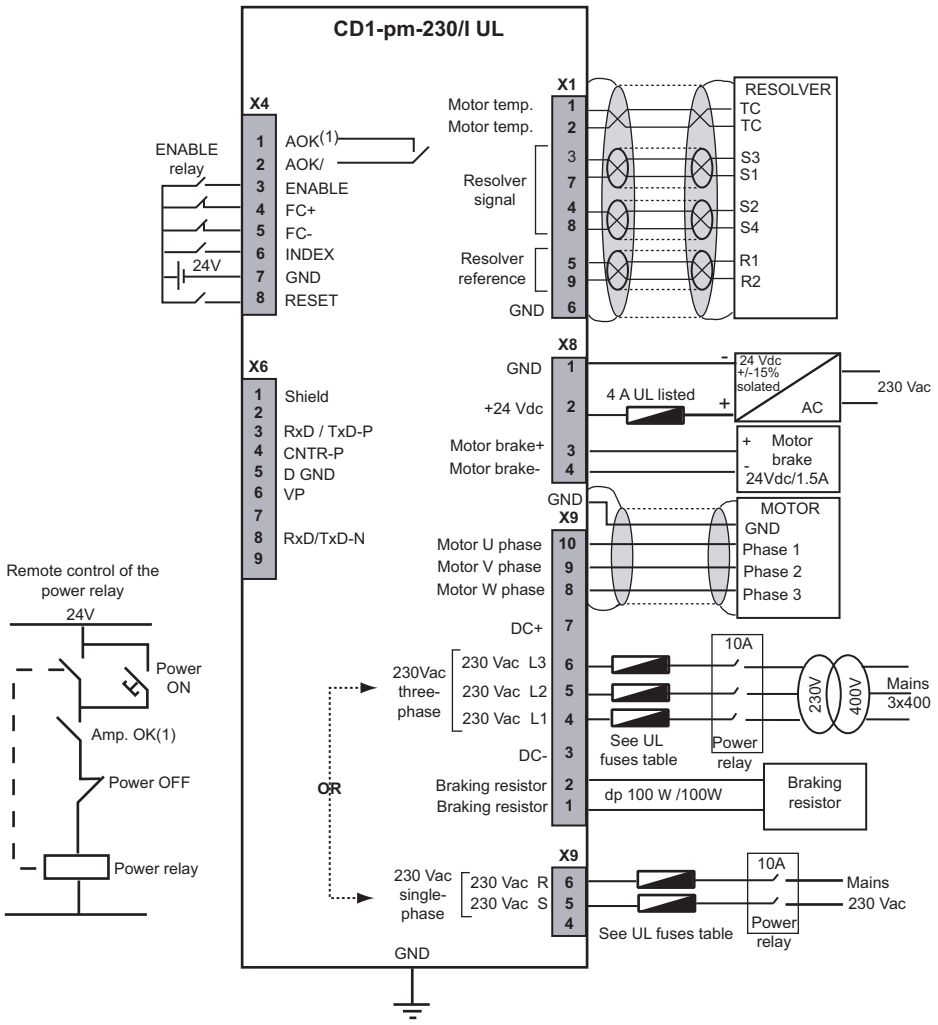
On Xtrapuls CD1-pm-230/I drives, the fuse ratings must be the following:

CD1-pm	230/2.5 to 10.5	230/16.5	Multiaxis
BUSSMANN Class RK5 Type FRN-R	FRN-R-6	FRN-R-9	$0,3 \times \sum_{1}^{N} I_{\text{rated amplifier}}$
LITTELFUSE Class RK5 Type FLNR-ID	FLNR6ID	FLNR9ID	$0,3 \times \sum_{1}^{N} I_{\text{rated amplifier}}$

For a multiaxis application with N drives, the fuse rating is calculated by the formula given in the table above. But a rating of 20 A must not be exceeded on 230 V drives (see chapter 4, section 1.5).

3.4 – XTRAPULS CD1-pm-230/I DRIVE: CONNECTION DIAGRAM WITH PROTECTIONS BY "UL" FUSES

(according to section 3.3 of this chapter).

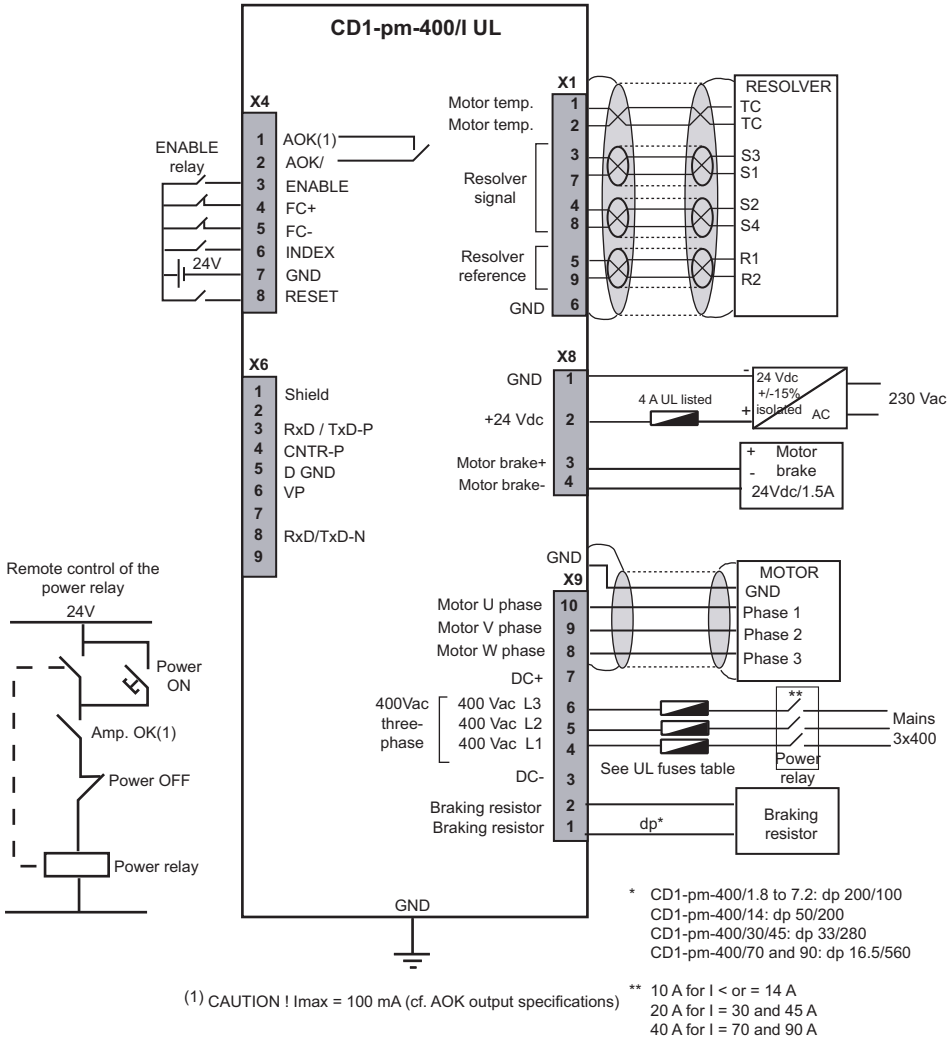


(1) CAUTION ! Imax = 100 mA (see AOK output specifications)

IMPORTANT

The installer of the drives has to use a UL listed quick connect for ground connection (0.250 inches or 6.35 mm wide nominal).
Field wiring terminals must use copper conductors only.
Torque value for field wiring terminals: according to the Recognized terminal block used.

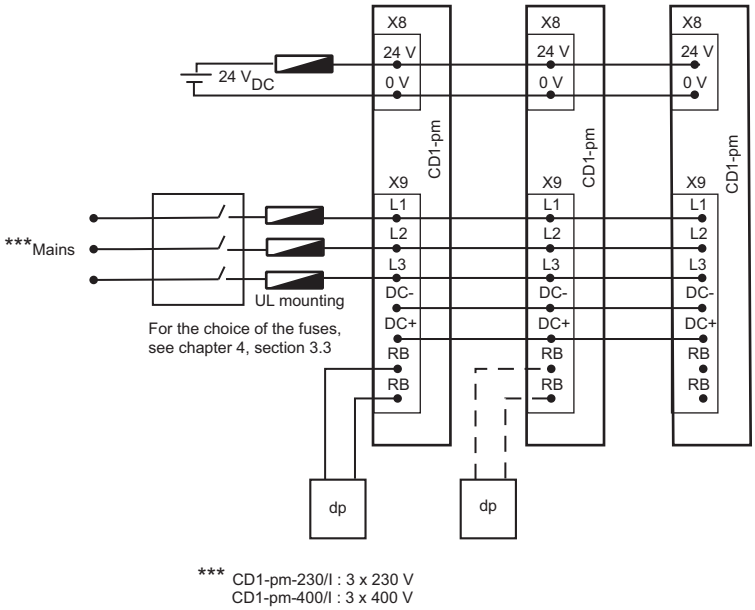
3.5 – XTRAPULS CD1-pm-400/I DRIVE: CONNECTION DIAGRAM WITH PROTECTIONS BY "UL" FUSES
(according to section 3.3 of this chapter)



IMPORTANT

- **The installer of the drives has to use a UL listed quick connect for ground connection (0.250 inches or 6.35 mm wide nominal)**
- **Field wiring terminals must use copper conductors only**
- **Torque value for field wiring terminals: according to the Recognized terminal block used.**

3.6 – CONNECTION EXAMPLE FOR A UL COMPLIANT MULTIAXIS APPLICATION



4 – FIRST POWERING OF THE XTRAPULS CD1-pm POSITIONER

4.1 - VERY IMPORTANT

Check the connections, particularly of the 24 VDC and power supplies. There are two different positioner voltage versions: 230 VAC and 400 VAC. Check for the appropriate label. It must be in accordance with the power connections. **The 400 VAC connection of a 230 V positioner will destroy it.**
The ENABLE signal (X4 connector, pin 3) must be inactive.

Check for the braking resistor sizing:
- dp 100/100 for 230 VAC
- dp 200/100 for 400 VAC and current ratings 1.8 to 7.2.
- dp 50/200 for 14 A current rating.
- dp 33/280 for 30/45 A current ratings.
- dp 16.5/560 for 70 and 90 A current ratings.

Check for the correct groundings and 360° shield connections.

WARNING
During the machine adjustments, some drive connection or parameter setting errors may involve dangerous axis movements. It is the user's responsibility to take all necessary steps in order to reduce the risk due to uncontrolled axis movements during the operators' presence in the concerned area.

4.2 - SWITCH ON THE 24 VDC SUPPLY

The green front panel "ON" Led must light up.
The red front panel "AP" Led must light up.
The "AOK" relay contact (pins 1 and 2 of X4) is closed. It is possible to control the power relay according to the recommendations of Chapter 4, section 1: Connection diagrams).
Connection according to X8 sticker.

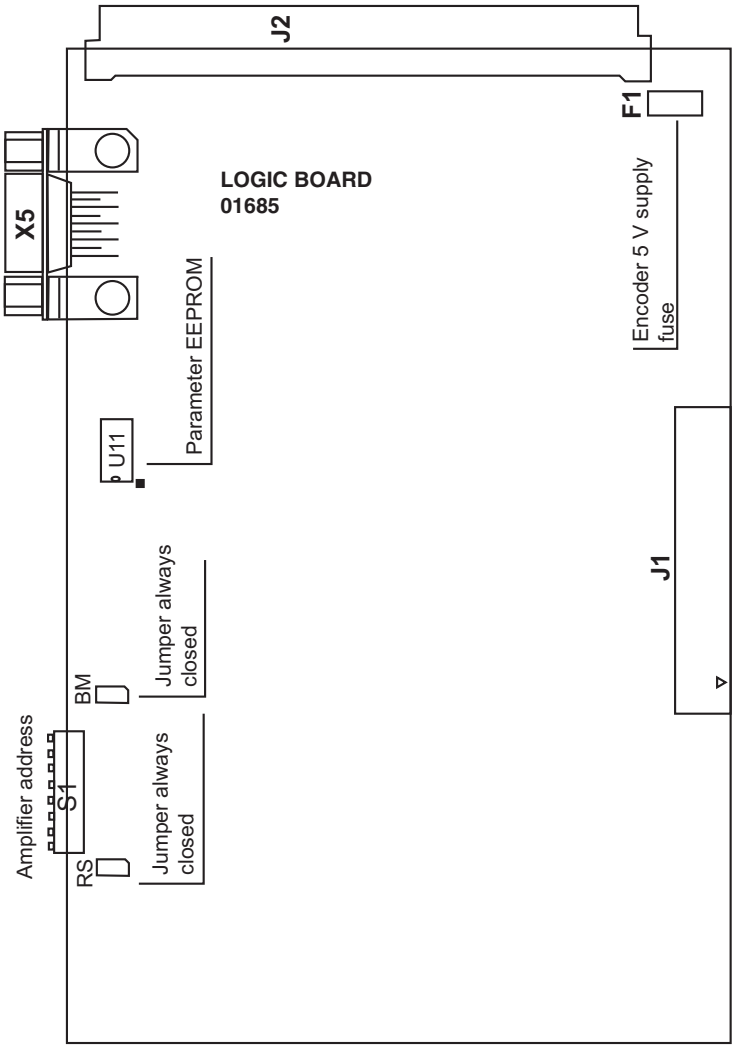
4.3 – SWITCH ON THE 230 VAC OR 400 VAC SUPPLY (according to the positioner type).

4.4 – FURTHER COMMISSIONING PROCEDURE

See manual " *Xtrapuls CD1-pm Positioner User guide*".

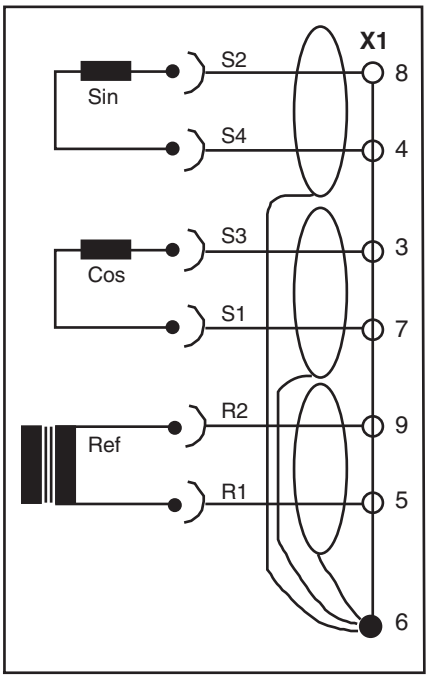
Chapter 5 – Appendix

1 - HARDWARE ADJUSTMENTS OF THE LOGIC BOARD



2 – ADJUSTMENT TO VARIOUS RESOLVER TYPES

For other resolver connections than the Infranor standard (chapter 3, section 3), see following wiring diagram of the **X1** connector as well as the manufacturer's diagram:

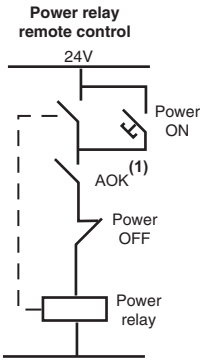


For the use of **resolvers** with **transformation ratios** out of the range 0.3 to 0.5, the adjustment must be factory set.

NOTE
When using resolvers with a number of pole pairs N > 1, all speed values displayed in the drive are equal to N times the motor rotation speed.

3 - USE OF THE "AOK" OUTPUT

The "AOK" output MUST be used on a potential free relay in order to allow the connection of the power supply (see Chapter 4, section 1: Connection diagrams).
The correct drive operation requires this connection logic. Switching on the power supply before initializing by means of the 24 VDC auxiliary supply will hinder the operation. It will then be necessary to proceed according to the instructions contained in this manual.



(1) **CAUTION** ! Imax = 100 mA (see AOK output specifications)

4 - ENERGY RECUPERATION VIA A BRAKING RESISTOR

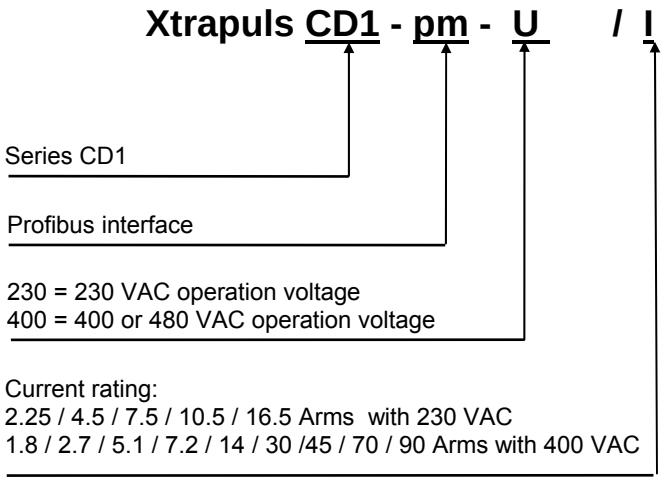
All Xtrapuls CD1 drives are equipped with the power feedback system. When the motor is decelerating with high inertia and high speed, the mechanical braking energy is reflected to the drive. This energy is dissipated inside a resistor called "braking resistor".

In order to avoid heat dissipation inside the drive, the braking resistor is **ALWAYS** mounted outside. It **MUST** be mounted out of range of heat sensitive and inflammable elements (plastic, cable sleeves, etc.).

For an optimum power feedback by the drives in a multiaxis application, the DC bus (DC+ and DC-) can be connected in parallel (see diagram in chapter 4, section 1.5).
In this case, the mains input must also be parallel wired in order to balance the current load inside the AC/DC converters.

It is recommended to mount the braking resistor on the drive with highest current rating.
An electronic control of the reflected power avoids the overload of the braking resistor. So, if the energy reflected to the drives with parallel mounted DC busses is too high, the DC bus voltage will rise up to the triggering of the "**Overvoltage**" fault. A second resistor must then be mounted on the second axis.

5 - ORDER CODE


Xtrapuls CD1 - pm - U / I
Series CD1
Profibus interface
230 = 230 VAC operation voltage
400 = 400 or 480 VAC operation voltage
Current rating:
2.25 / 4.5 / 7.5 / 10.5 / 16.5 Arms with 230 VAC
1.8 / 2.7 / 5.1 / 7.2 / 14 / 30 /45 / 70 / 90 Arms with 400 VAC